

interaction with the microbial organisms. These agents may be used alone or in combination.

[0062] A particularly preferred antimicrobial agent is sorbic acid (0.15%). Other known antimicrobial agents include known organic nitrogen-containing agents such as biguanides. The biguanides include the free bases or salts of alexidine, chlorhexidine, hexamethylene biguanides and their polymers, and/or combinations of the foregoing. The biguanide salts are typically gluconates, nitrates, acetates, phosphates, sulfates, halides and the like. A preferred biguanide is the hexamethylene biguanide commercially available from Zeneca, Wilmington, DE under the trademark Cosmocil™ CQ. Generally, the hexamethylene biguanide polymers, also referred to as polyhexamethylene biguanide (PHMB) or polyaminopropyl biguanide (PAPB), have molecular weights of up to about 100,000. Yet another example of a known primary antimicrobial agent is various materials available as polyquaternium-1.

[0063] The amount of the antimicrobial agent may vary depending on the specific agent employed. For the aforementioned organic nitrogen-containing agent, typically, such agents are present in concentrations ranging from about 0.00001 to about 0.5% weight percent, and more preferably, from about 0.00003 % to about 0.05% weight percent. For sorbic acid, higher amounts may be required, typically 0.01 to 1 weight percent, more preferably 0.1 to 0.5 weight percent. It is preferred that the antimicrobial agent is used in an amount that will at least partially reduce the microorganism population in the formulations employed. If desired, the antimicrobial agent may be employed in a disinfecting amount, which will reduce the microbial bioburden by at least two log orders in four hours and more preferably by one log order in one hour. Most preferably, a disinfecting amount is an amount which will eliminate the microbial burden on a contact lens when used in regimen for the recommended soaking time (FDA Chemical Disinfection Efficacy Test-July, 1985 Contact Lens Solution Draft Guidelines).

[0064] The inclusion of an antimicrobial agent is not required to achieve the inhibition of bacterial attachment, but the antimicrobial agent is useful for at least partially

reducing the microorganisms present on a contact lens, and, as mentioned, preferably this agent is used a disinfecting amount that which will reduce the microbial bioburden by two log orders in four hours and more preferably by at least one log order in one hour.

[0065] The aqueous contact lens solutions of the present invention are typically adjusted with tonicity agents to approximate the tonicity of normal lachrymal fluids (approximately equivalent to a 0.9% solution of sodium chloride or 2.8% glycerol solution). The solutions are made substantially isotonic with physiological saline used alone or in combination with other adjusting agents. The ophthalmic compositions preferably have an osmolality of about 225 mOsm/kg to 400 mOsm/kg, more preferably 280 mOsm/kg to 320 mOsm/kg.

[0066] The compositions may include chelating or sequestering agents in order to chelate or bind metal ions, which might otherwise react with the lens and/or protein deposits and collect on the lens. Examples of such preferred materials, may include, but are not limited to ethylene-diaminetetraacetic acid (EDTA) and its salts (disodium), which are usually added in amounts ranging from about 0.01 weight percent to about 0.2 weight percent.

[0067] The pH of the solutions and/or compositions of the present invention may be maintained within the range of pH = 5.0 to 8.0, preferably about pH = 6.0 to 8.0, more preferably about pH = 6.5 to 7.8, most preferably pH values of greater than or equal to 7; suitable buffers may be added, such as borate, citrate, bicarbonate, tris(hydroxymethyl)aminomethane (TRIS-Base) and various mixed phosphate buffers (which may include combinations of  $\text{Na}_2\text{HPO}_4$ ,  $\text{NaH}_2\text{PO}_4$  and  $\text{KH}_2\text{PO}_4$ ) and mixtures thereof. Borate buffers are preferred when the primary antimicrobial agent is PAPB. Generally, buffers will be used in amounts ranging from about 0.05 percent by weight to 2.5 percent by weight, and preferably, from 0.1 percent by weight to 1.5 percent weight.

[0068] The compositions of this invention may be useful as a component of a cleaning, disinfecting or conditioning solution and/or composition. Such solutions and/or compositions also may include, antimicrobial agents, surfactants, toxicity adjusting agents,